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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,844	05/04/2007	Thomas Schmidt	12834-00021-US	2786
23416 7590 09/14/2011 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899				
EXAMINER ARCIERO, ADAM A				
ART UNIT		PAPER NUMBER		
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09/14/2011		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary**Application No.**

10/589,844

Applicant(s)

SCHMIDT ET AL.

Examiner

ADAM A. ARCIERO

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-36 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-36 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____

**HIGH-PERFORMANCE MEMBRANE ELECTRODE UNIT AND THE USE THEREOF
IN FUEL CELLS**

Examiner: Adam Arciero

S.N. 10/589,844

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September 9, 2011

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 25, 2011 has been entered. Claims 35-36 are newly added.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in a prior Office Action.

Claim Rejections - 35 USC § 103

3. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Bjerrum et al. and Buchanan et al. on claims 1 and 3-24 and 28-34 are maintained. Newly added claims 35-36 are rejected under the same rejections.

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4. Claims 1 and 3-24 and 28-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bjerrum et al. (WO 01/18894 A2, found in IDS) in view of Buchanan et al. (US 5,759,944 A).

As to Claims 1 and 31, Bjerrum et al. discloses a membrane electrode assembly comprising an acid-doped solid electrolyte including at least one polymer with at least one nitrogen atom (polybenzimidazole) (pg. 9, line 15 to pg. 10, line 5) and at least one mineral acid (phosphoric acid) (pg. 13, lines 19-30). Bjerrum et al. discloses wherein at least one electrode comprises a catalyst comprising a composite of platinum with chromium, titanium or tungsten (pg. 16, lines 20-26). Bjerrum et al. does not specifically disclose wherein the catalyst comprises at least one precious metal of the platinum group, and/or at least one precious metal Au and/or Ag, as well as Ni.

However, Buchanan et al. teaches of a phosphoric acid fuel cell comprising a catalytically active layer comprising a catalyst composition such as platinum alloyed with Ni and Au (col. 1, line 54, to col. 2, line 8). Buchanan et al. is clearly teaching that Ni and Ti for use with platinum as a catalyst for a fuel cell electrode are considered functionally equivalent. Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute the Pt/Au/Ni catalyst layer of Buchanan et al. for the Pt/Ti catalyst layer of Bjerrum et al., because Kiefer et al. teaches that they are recognized equivalents. Furthermore, it would have been obvious at the time of the invention to modify the catalyst of Bjerrum et al. with a Pt/Au/Ni catalyst, because Buchanan et al. teaches that the power density of the fuel cell stack can be increased while reducing the capital cost per unit of power, thereby providing a fuel cell with improved performance (col. 1, lines 10-37).

As to Claims 3-5, Bjerrum et al. discloses wherein the membrane comprises an alkaline polymer containing at least one aromatic ring with at least one nitrogen atom, such as polybenzimidazole (pg. 9, line 15 to pg. 10, line 5).

As to Claim 6, Bjerrum et al. discloses wherein the membrane comprises a polymer blend of more than one polymer (pg. 9, line 15 to pg. 10, line 13).

As to Claims 7 and 34, Bjerrum et al. discloses wherein the at least one mineral acid is phosphoric acid (pg. 13, lines 19-30).

As to Claim 8, Bjerrum et al. discloses wherein said membrane comprises parapolybenzimidazoles (pg. 9, lines 29-35).

As to Claims 9-22 and 32, it is noted that claims 9-22 and 32 are product-by-process claims. "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Since Bjerrum et al.'s membrane is the same to that of the Applicant's, Applicant's process is not given patentable weight in this claim.

As to Claim 23, Bjerrum et al. discloses wherein at least one electrode comprises a catalyst comprising a composite of platinum with chromium, titanium or tungsten (pg. 16, lines 20-26). Bjerrum et al. does not specifically disclose wherein the catalyst comprises at least one precious metal of the platinum group, and/or at least one precious metal Au and/or Ag, as well as Ni.

As to Claim 24, Bjerrum et al. discloses wherein the catalyst is applied to the membrane (pg. 16, lines 20-22).

As to Claims 28 and 33, Bjerrum et al. discloses wherein the catalyst loading of the membrane electrode unit is 0.1 mg/cm^2 to 1.0 mg/cm^2 (pg. 17, lines 4-17).

As to Claim 29, Bjerrum et al. discloses wherein the catalyst particles include carbon as a support ((pg. 17, lines 4-17).

As to Claim 30, Bjerrum et al. discloses wherein the weight ratio of catalyst particles is in a range of 1:100 or 100:1 (pg. 16, lines 20-22).

As to Claims 35-36, Bjerrum et al. discloses wherein at least one electrode comprises a catalyst comprising a composite of platinum with chromium, titanium or tungsten (pg. 16, lines 20-26). Bjerrum et al. does not specifically disclose wherein the catalyst comprises at least one precious metal of the platinum group, and/or at least one precious metal Au and/or Ag, as well as Ni.

However, Buchanan et al. teaches of a phosphoric acid fuel cell comprising a catalytically active layer comprising a catalyst composition such as platinum alloyed with Ni and Au (col. 1, line 54, to col. 2, line 8). Buchanan et al. is clearly teaching that Ni and Ti for use with platinum as a catalyst for a fuel cell electrode are considered functionally equivalent. Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute the Pt/Au/Ni catalyst layer of Buchanan et al. for the Pt/Ti catalyst layer of Bjerrum et al., because Kiefer et al. teaches that they are recognized equivalents. Furthermore, it would have been obvious at the time of the invention to modify the catalyst of Bjerrum et al. with a Pt/Au/Ni catalyst, because Buchanan et al. teaches that the power density of the fuel cell stack can be increased while reducing the capital cost per unit of power, thereby providing a fuel cell

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with improved performance (col. 1, lines 10-37). The catalyst of Bjerrum et al. and Buchanan et al. consists of Pt/Au/Ni.

5. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Bjerrum et al., Buchanan et al. and Kiefer et al. on claims 2 and 25-27 are maintained.

6. Claims 2 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bjerrum et al. (WO 01/18894 A2, found in IDS) in view of Buchanan et al. (US 5,759,944 A), as applied to claims 1 and 3-24 and 28-34 above, and in further view of Kiefer et al. (US 2005/0084727 A1).

As to Claim 2, Bjerrum et al. and Buchanan et al. do not specifically disclose wherein a polyphosphazene is employed as the polymer with at least one nitrogen atom.

However, Kiefer et al. teaches of a PEM comprising a polymer with a nitrogen atom such as a polyphosphazene polymer or a polyazole (polybenzimidazole) (paragraph [0041]). Kiefer is identifying the two polymers as functional equivalents for use in membranes of fuel cells. The courts have found that since both Bjerrum et al. and Kiefer et al. both teach a suitable polymer for a membrane in a fuel cell, it would have been *prima facie* obvious to substitute one material for the other. Express suggestion to substitute one equivalent for another need not be present to render such substitution obvious. See MPEP 2144, KSR.

As to Claim 25, Bjerrum et al. and Buchanan et al. do not specifically disclose wherein the catalyst layer has a thickness of 0.1 to 50 microns.

However, Kiefer et al. teaches of a catalyst layer with a preferable thickness in the

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range of 1 to 1,000 microns. This overlaps the claimed ranges. The courts have held that when “a prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient to establish a *prima facie* case of obviousness.” *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir. 2003).

As to Claims 26-27, Bjerrum et al. and Buchanan et al. do not specifically disclose the particle sizes of the catalyst.

However, Kiefer et al. teaches of catalyst particles with a preferable size of 1 to 1,000 nm (paragraph [0166]). This overlaps the claimed ranges. The courts have held that when “a prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient to establish a *prima facie* case of obviousness.” *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir. 2003).

Response to Arguments

7. Applicant's arguments filed August 25, 2011 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

a) *Buchanan relates to an acid electrolyte and not a polymer electrolyte as claimed (claim 1).*

b) *Examiner is considering the two "different" electrolytes of Bjerrum and Buchanan as being functionally equivalent (claim 1).*

c) *Buchanan only mentions the use of gold to improve the catalyst, not nickel (claim 1).*

d) There is no teaching by Bjerrum for which steps have to be taken to improve the performance of a catalyst for a polyazole/phosphoric acid PEM (claim 1).

e) There is no teaching in Kiefer of which steps have to be taken to improve the performance of a catalyst for polyazole/phosphoric acid PEM (claims 2 and 25-27).

In response to Applicant's arguments, please consider the following comments:

a) Polymer electrolytes can comprise acids. Furthermore, claim 1 uses open-ended language "comprising" which does not exclude acids. Even furthermore, Buchanan teaches that the catalysts can be used in PEM fuel cells (col. 2, lines 48-56).

b) Examiner did not make such a statement. Buchanan teaches that catalysts used fuel cells such as Ni and Ti in combination with Pt as being functionally equivalent.

c) Buchanan clearly mentions the use of nickel with platinum as a catalyst for a PEM fuel cell, as well as with the addition of gold to improve the catalyst. Furthermore, claim 1 can comprise gold with the platinum and nickel catalysts.

d) In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Buchanan was used as a teaching for improving the performance of the catalysts as a secondary reference.

e) In response to applicant's argument that Kiefer does not take steps to improve the performance of a catalyst, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the

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basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 7am to 4pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on 571-272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ADAM A ARCIERO/
Examiner, Art Unit 1727

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/Barbara L. Gilliam/

Supervisory Patent Examiner, Art Unit 1727